Appendix

For first order plug flow reactor, the following kinetic equation will hold:

$WHSV_{MeOH} = KC_{MeOH}M_{MeOH}/-Ln(1-X_{MeOH})$---(1)

Where,
K=rate constant, function of temperature
C_{MeOH}=MeOH concentration at reactor inlet (mol/ml)
M_{MeOH}= Methanol molecular weight
$WHSV_{MeOH}$=weight hourly space velocity of methanol
X_{MeOH} =conversion of methanol

It is noted from equation (1) when temperature is not changed, $KC_{MeOH}M_{MeOH}$ remains constant. MeOH conversion X_{MeOH} should decrease with increase in $WHSV_{MeOH}$. Using this kinetic equation, by entering $WHSV_{MeOH}$ at 99.9% (13.4), we obtained $WHSV_{MeOH}$ at 57% conversion=109.7 h^{-1}, which is equivalent to LHSV=249.6 h^{-1} (S/C=1.78)

S/C=	1.78	w/w=	1.00125
LHSV=	30.5	Density=	0.88
Total WHSV=	26.84	g/cc.h	
WHSV MeOH=	13.41162	g/cc.h	
WHSV H2O	13.42838	g/cc.h	

Conversion at LHSV=30.5h-1	0.999	
Conversion at 57%	0.57	
Calculated WHSV MeOH at 57%	109.7719	g/cc.h
WHSV H2Oat 57%	109.9091	g/cc.h
Total LHSV	249.6374	h-1